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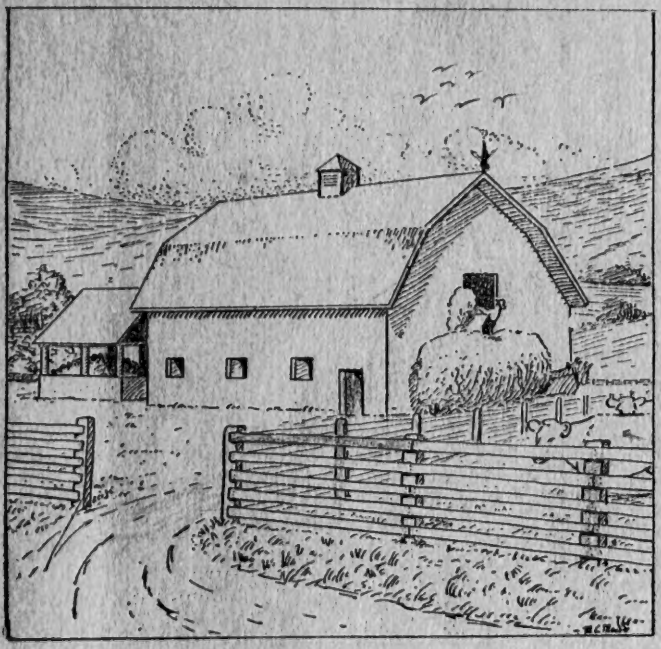
RURAL ARITHMETIC

By JOHN E. CALFEE



FARM PROBLEMS FOR THE FARMER AND HIS CHILDREN

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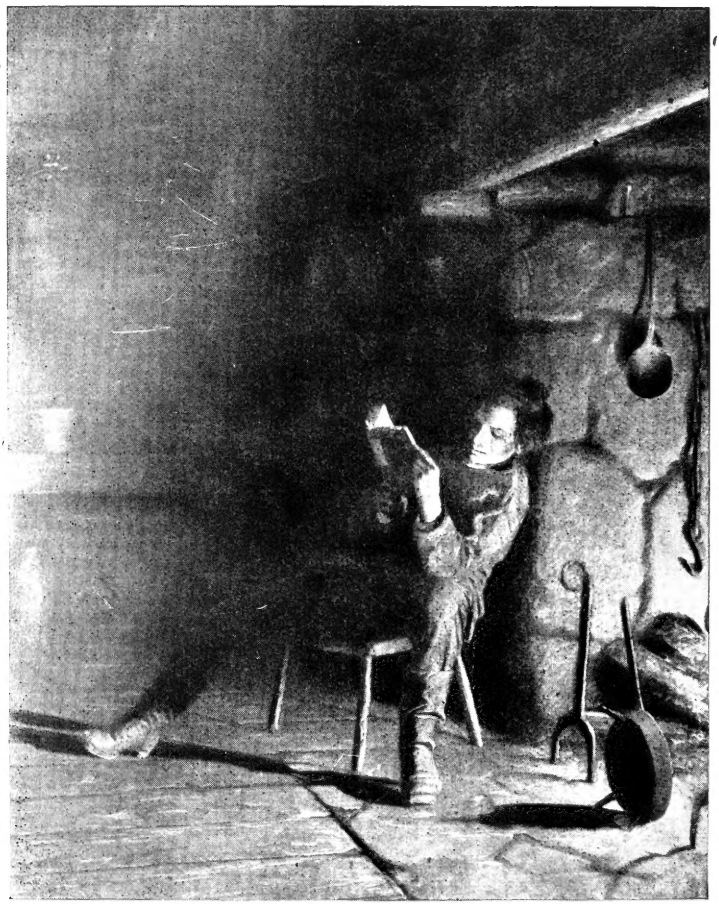

THE BOY LINCOLN
Painting by Eastman Johnson, now in the Berea College Library.

RURAL ARITHMETIC

Starting Children to Think and Figure on Home and Its Improvement

By
JOHN E. CALFEE
Department of Mathematics, Berea College Normal, Berea, Ky.

Our ability to maintain schools depends upon our appreciation of our children and their education, rather than upon the amount of stock and land we own.

BEREA, KY.
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ABOUT THIS BOOK

This little book will do four things:

First, it will help any farmer do his own figuring. Any man who can add, subtract, multiply and divide, and will sit down with this book an hour a day for one winter, will be able to do his own figuring.

Second, this book will give the farmer and his boys and girls a lot of fun. There is as much fun in this book as in a checker-board!

Third, in the school room this book will interest every pupil. It talks about things we handle every day. It helps in our home work. Our children need these problems more than they need problems about banks and city business.

And in the fourth place, this little book will help make our country people prosperous. Head-work pays on the farm as well as anywhere. This book sets us to studying the things that pay, like good seed, good buildings, good management. It show us just how one bad ear of seed-corn causes the farmer a loss of four dollars.

Go forth little book, and help the Good Lord in his blessed work of making more corn grow, more lambs and calves frisk in the pastures, more happy children brighten the path between the home and the church-house and the school!

WM. GOODELL FROST.

Berea College,
May, 1912

The author sincerely desires to thank his Students and Professors Charles D. Lewis, E. C. Seale, John F. Smith, F. O. Clark and President Frost for their advice and criticism.

J. E. C.

RURAL ARITHMETIC

A WORD WITH TEACHERS

The old time teaching of arithmetic, to a large extent, was done to prepare pupils for passing examinations. Arithmetics were made and taught to this end. Expressed or implied, the theory was that the function of the elementary school was to prepare for college. The child who was never to enter college was looked upon as a very unfortunate being. He was reckoned with as of little promise, and in consequence no definite provision was made for those who must toil and do the world's work by the sweat of the brow. They were set adrift to take up the worlds industrial and commercial work with practically no preparation for economic and industrial efficiency. As the result, the soil has been abused, worn out, much of the timber wasted, and many once fertile farms abandoned.

The purpose of this book is to touch every phase of farm management. The problems are real and practical, taken from every day farm life. The information given is reliable, valuable, and can be used to increase the profits in farming. The country boy and girl are to be taught in terms of their immediate surroundings. They are to be given a chance to solve problems in which they and their parents are vitally interested. The management of the farm is to be made an attractive and intelligent subject for conversation around the home fireside during the long winter evenings. A sane practical business outlook upon the administration of farm affairs will develop in the children a broad statesman-like view of the unbounded opportunities for accumulation of wealth and happiness on the farm. The farmers' children are entitled to have a fair chance thru

their education to remain on the farm as successful farmers, and to this end I submit this little book.

TEACHING ARITHMETIC

The mastery of arithmetic depends upon the pupils skill in using the fundamental processes. The ability to add, subtract, multiply and divide, rapidly and accurately, is at the foundation of all satisfactory progress in the study of arithmetic. A large part of the errors in business calculations are caused by illegible figures that are placed in irregular columns for addition. More stress should be placed upon teaching children to make neat, legible figures of uniform size.

Dictation exercises in writing numbers should be given until the child can rapidly write numbers, placing units of the same order in the same vertical column.

Much practice should be given in reading at a glance numbers consisting of from two to five figures, without naming the individual figures. A good reader takes in a word at a glance, without thinking of the separate letters forming the word; the same standard should be set for reading numbers.

HINTS

Addition of two numbers consisting of one or two figures each should be done at sight.

ORAL EXERCISE

Name at sight the sum of each of the following problems:

(1)	3	2	5	4	7	4	6	8	8	6	7	9	7	5	10
	2	3	3	6	6	7	5	7	5	8	8	8	9	9	9
	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

	11	12	10	12	19	22	23	27	32	37	42
	8	8	13	14	18	19	16	21	28	32	37
(2)	26	29	33	45	36	47	58	63	77	88	91
	4	7	8	9	5	8	9	8	9	7	5
(3)	12	13	12	11	17	19	18	19	15	18	17	19
	12	13	15	16	18	15	13	14	17	16	11	17
(4)	34	17	19	37	42	31	44	29	48	51	55
	25	25	23	21	35	29	37	41	34	29	46
	28	39	81	76	67	78	35	59	49	73	85
	33	27	16	22	29	24	17	28	62	38	78

The addition of several numbers arranged in vertical columns can be simplified and rendered much easier by thinking only sums.

In adding 35 46 77 68 29 think 17, 24, 30, and 35, and not 9 and 8 are 17 and 7 are 24 and 6 are 30 and 5 are 35.

ORAL EXERCISE

Speaking only the sums, add the following:

385	416	212	297	811	877	288	937
276	289	378	578	762	689	999	823
425	375	829	879	879	578	878	578
738	891	657	683	648	639	657	717
897	345	762	479	532	721	894	816
365	278	259	178	891	278	335	217

SUBTRACTION BY THE METHOD OF "MAKING CHANGE"

Speak the number in each of the following which added to the smaller, gives the larger number:

3	5	7	9	8	9	10	11	12	14	15	14	17	18	16	15
1	2	4	5	3	4	6	4	5	6	8	6	9	8	7	9

16	17	19	22	27	29	34	37	39	31	33	42
12	13	15	16	15	17	18	16	12	16	17	16

81	47	28	47	49	$2.00	$5.00	$10.00	$5.00
27	19	11	29	24	$1.25	$3.50	$6.75	$1.75

No attempt is made in this book to supply sufficient exercises in addition, subtraction, multiplication and division. The teacher who finds his students in need of practice can easily prepare the necessary exercises.

MULTIPLICATION

The sixty-four primary facts of multiplication must be perfectly memorized before the pupil can become skilled in the process. They are as follows:

2 times 2 equals 4	3 times 2 equals 6
2 times 3 equals 6	3 times 3 equals 9
2 times 4 equals 8	3 times 4 equals 12
2 times 5 equals 10	3 times 5 equals 15
2 times 6 equals 12	3 times 6 equals 18
2 times 7 equals 14	3 times 7 equals 21
2 times 8 equals 16	3 times 8 equals 24
2 times 9 equals 18	3 times 9 equals 27

4 times 2 equals 8	5 times 2 equals 10
4 times 3 equals 12	5 times 3 equals 15
4 times 4 equals 16	5 times 4 equals 20
4 times 5 equals 20	5 times 5 equals 25
4 times 6 equals 24	5 times 6 equals 30
4 times 7 equals 28	5 times 7 equals 35
4 times 8 equals 32	5 times 8 equals 40
4 times 9 equals 36	5 times 9 equals 45

6 times 2 equals 12	7 times 2 equals 14
6 times 3 equals 18	7 times 3 equals 21
6 times 4 equals 24	7 times 4 equals 28
6 times 5 equals 30	7 times 5 equals 35
6 times 6 equals 36	7 times 6 equals 42
6 times 7 equals 42	7 times 7 equals 49
6 times 8 equals 48	7 times 8 equals 56
6 times 9 equals 54	7 times 9 equals 63
8 times 2 equals 16	9 times 2 equals 18
8 times 3 equals 24	9 times 3 equals 27
8 times 4 equals 32	9 times 4 equals 36
8 times 5 equals 40	9 times 5 equals 45
8 times 6 equals 48	9 times 6 equals 54
8 times 7 equals 56	9 times 7 equals 63
8 times 8 equals 64	9 times 8 equals 72
8 times 9 equals 72	9 times 9 equals 81

Owing to the large number of business transactions in which the price is 6¼, 7½, 8⅓, and 12½c per article, yard, or pound, it is very convenient and important to memorize a merchant's table of multiplication. It is as follows:

2 times 6¼ equals 12½	2 times 7½ equals 15
3 times 6¼ equals 18¾	3 times 7½ equals 22½
4 times 6¼ equals 25	4 times 7½ equals 30
5 times 6¼ equals 31¼	5 times 7½ equals 37½
6 times 6¼ equals 37½	6 times 7½ equals 45
7 times 6¼ equals 43¾	7 times 7½ equals 52½
8 times 6¼ equals 50	8 times 7½ equals 60
9 times 6¼ equals 56¼	9 times 7½ equals 67½
10 times 6¼ equals 62½	10 times 7½ equals 75
11 times 6¼ equals 68¾	11 times 7½ equals 82½
12 times 6¼ equals 75	12 times 7½ equals 90

2 times 8⅓ equals 16⅔	2 times 12½ equals 25
3 times 8⅓ equals 25	3 times 12½ equals 37½
4 times 8⅓ equals 33⅓	4 times 12½ equals 50
5 times 8⅓ equals 41⅔	5 times 12½ equals 62½
6 times 8⅓ equals 50	6 times 12½ equals 75
7 times 8⅓ equals 58⅓	7 times 12½ equals 87½
8 times 8⅓ equals 66⅔	8 times 12½ equals 100
9 times 8⅓ equals 75	9 times 12½ equals 112½
10 times 8⅓ equals 83⅓	10 times 12½ equals 125
11 times 8⅓ equals 91⅔	11 times 12½ equals 137½
12 times 8⅓ equals 100	12 times 12½ equals 150

JUDGING DISTANCE, SURFACE AND BULK

Every child should be made so familiar with the units of measure that he can measure distance, surface and volume fairly accurately with the eye.

1. Lay off a square yard on the wall or blackboard with colored crayon. Put it in a conspicuous place and do not erase.

2. In one corner of the square yard lay off a square foot.

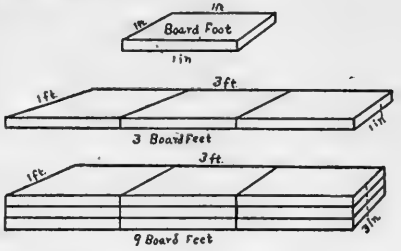
3. Require each pupil to approximate the square yards in the school room floor, then measure and determine the exact number.

4. Require each pupil to approximate the square feet in the blackboard, then measure and determine the exact number.

5. How many square feet in the floor?

6. How many square yards in the wall?

LUMBER MEASURE



A board foot is the unit in measuring lumber. It is a board one foot square and one inch or less thick. It contains 144 square inches.

Lumber dealers usually speak of board feet as feet.

1. On a board 6 inches wide, mark the length of a board that will contain 144 square inches (a board foot).

2. On a board 8 inches wide, mark the length of a board that will contain 144 square inches (a board foot).

3. On a board 4 inches wide, mark the length of a board that will contain 144 square inches (a board foot)

4. On a board 10 inches wide, mark off a board foot.

To find the number of board feet in a piece of lumber, divide by 12 the product of its length in feet by its width and thickness in inches.

The work may usually be shortened by arranging it in the form for cancellation. How many feet in a plank 18 ft. long, 8 inches wide and 1 inch thick?

Solution $(18 \times 8 \times 1) \div 12 = 12$ feet.

How many feet of lumber in a sill 12 ft. long, 8 inches wide and 6 inches thick?

Solution $(12 \times 8 \times 6) \div 12 = 48$ feet.

In billing lumber the number of pieces is written first, then the thickness and width in inches and the length in feet, and then the kind of lumber.

2. Estimate the number of feet in the following:

10 pieces 2 in. × 4 in. × 12 ft., oak .. 80
12 " 3 in. × 8 in. × 16 ft., " .. 384
16 " 3 in. × 6 in. × 18 ft., " .. ——
80 " 3 in. × 8 in. × 20 ft., " .. ——

Total .. ——

1. Estimate the number of feet in the following:

12 boards 10 in. × 1 in. × 12 ft., oak boxing .. ——
25 " 8 in. × 1 in. × 14 ft., " " .. ——
60 " 6 in. × 1 in. × 16 ft., " " .. ——
36 " 8 in. × 1 in. × 12 ft., " " .. ——

Total .. ——

To find the cost of a bill of lumber, multiply the cost per hundred feet by the number of feet and point off two additional decimal places in the product.

Find the cost of 75 feet of lumber at $2.12 per hundred.

Solution $2.12 × 75 = $1.5900.

Find the cost of 80 feet of lumber at $2 per hundred.

Solution $2 × 80 = $1.60.

3. At $1.75 per hundred find the total cost of:

7 joists 2 in. × 10 in. × 18 ft. .. ——
75 planks 1 in. × 8 in. × 14 ft. .. ——
30 scantling 2 in. × 4 in. × 12 ft. .. ——

Total .. ——

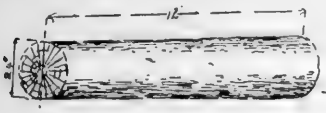
4. Find the cost, at $1.00 per hundred, of the lumber required to build a yard fence 150 ft. long. The boards used are 1 in. × 4 in. × 12 ft., and the fence is 5 boards high.

5. Find the total cost of the following:

20 scantling 2 in. × 4 in. × 16 ft. at $1.50 per hundred
60 planks 1 in. × 6 in. × 14 ft. at $1.75 " "
100 " 1 in. × 4 in. × 12 ft. at $2.25 " "

MEASURING LUMBER IN THE LOG

The rule most generally used in our section is Doyle's Rule: Take 4 inches off the diameter for slab, multiply the remainder by one-half of itself, then by the length of the log in feet, and divide by 8.



How many feet of lumber in this log?

Solution: Take 4 in. off 24 in. (the smaller diameter); multiply 20 (the difference) by 10 (one-half the difference), then by 12 ft. (the length of the log), and divide by 8=300 ft.

1. How many feet of lumber in a log 12 ft. long, 32 in. in diameter?

2. Estimate the board feet in the following:

3 logs 14 feet long, 36 inches in diameter.

2 logs 16 feet long, 24 inches in diameter.

3. At 50c per hundred for sawing, what will it cost to have sawed 10 logs 16 feet long, 18 inches in diameter?

4. How many chests 4 feet long, 2 feet wide and 1⅓ feet deep can be made from a walnut log 16 feet long, 30 inches in diameter?

5. An oak tree 11 in. in diameter, contains about 46 ft. of lumber. After a growth of 8 years it contains 125 ft. At $1.00 per hundred, what is the value of the growth on the oak in 50 acres of forest, averaging 30 oaks to the acre?

6. A poplar tree 10 in. in diameter contains about 46 ft. of lumber. After a growth of 10 years it contains 200 ft. At $1.75 per hundred what is the value of the growth on 400 trees?

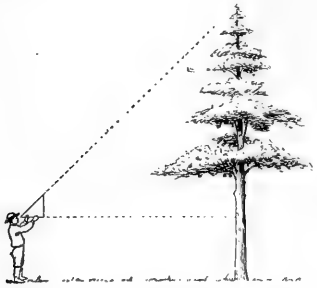
7. Counting one railroad tie to a tree 11 in. in diameter, which is the better business to cut 800 tie trees when ties are selling at 55c apiece, delivered, or take the growth on them for 12 years, at which time the trees will average 170 ft., worth $1.50 per hundred standing?

8. A cubic foot of oak weighing 64 pounds, what is the weight upon a wagon loaded with 16 ties 8½ ft. long, 9 in. wide and 7 inches thick?

9. Placing railroad ties 2 ft. apart, how many are required for 1 mile of track?

MEASURING THE HEIGHT OF A TREE

To make a triangle for measuring the height of a tree; nail two straight strips together, making a square corner at the point of contact, then saw off each strip exactly six inches from the corner and join their ends with a strip.



Measuring the height of a tree.

To measure the height of a tree, take such a position on a level with the foot of the tree to be measured, that when the triangle is held in the position shown in the picture, the eye, the longest side of the triangle, and the point whose height is to be measured, will be in the same straight line. Measure the distance from where you stand to the foot of the tree and to this add your own height, this will give the approximate height of the point measured.

1. Measure with your triangle the height of a tree, then measure carefully with a string and find how nearly accurate you were with the triangle.

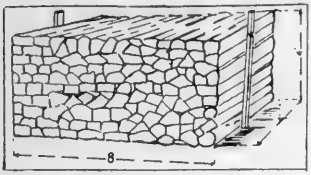
2. Using your triangle measure the height of your school house. Your home.

3. What is the height of the tallest tree on your father's farm? In your neighborhood?

CORD WOOD AND TAN BARK

Cord wood is 4ft. long. A cord is a pile 8 ft. long and 4 ft. high.

1. Which is cheaper for a man living in town, to buy stove wood 16 in. long at $1.50 per cord, or pay $2 per cord for cord wood and give a man $1.50 to saw and split it into stove wood?



2. How many cords of wood does a man have on a rack 12 ft. long and 4 ft. high?

3. Make an estimate of the number of cords in the fallen trees that are wasting on your father's farm.

4. How many cords of oak bark in a rick 24 ft. long and 10 ft. high?

5. At $12 per cord, what is the value of a rick of tan bark 40 ft. long and 6 ft. high?

STOVE WOOD

A cord of stove wood is a rick of wood 8 ft. long and 4 ft. high and any length that will fit a stove.

To find the number of cords in a rick, multiply the length of the rick, by the height in feet and divide by 32.

1. A cord of wood for cooking purposes lasts a family 3 weeks; when wood is $1.25 per cord, how much does the family pay out in the course of a year for cook-stove wood?

2. How many cords in a rick of wood 18 ft. long and 4 ft. high?

3. How many cords of wood 16 in. long can be placed crosswise in a wagon bed 10 ft. long, 3 ft. wide and 14 in. deep?

4. If a cord of wood lasts a family 4 weeks, a rick 4 ft. high must be how long to last the family a year?

ESTIMATING COAL

35 cu. ft. of Kentucky's best grade coal makes a ton.

1. How many bushels of coal in a wagon-bed 9 ft. long, 3 ft. wide, and 15 in. deep?

2. How many tons of coal will a coal-shed 12 ft. long, 8 ft. wide, and 7 ft. high hold?

3. Measure the thickness of a vein of coal in your neighborhood and estimate the number of tons under an acre of land. What is it worth at 10c per ton?

4. How many tons of coal can be placed in a car 36 feet long, 8 feet wide, and 5 feet deep?

PRODUCE, GRAIN AND STOCK MARKET

PRODUCE AND GRAIN MARKET

July 22, 1912

Name of Article	Local Market Price	City Market Price
Butter, per lb.	.....	.....
Eggs, per doz	.....	.....
Hens, per lb.	.....	.....
Hogs, per cwt.	.....	.....
Steers—fat, per cwt.	.....	.....
—feeders, per cwt.	.....	.....
Yearlings, per cwt.	.....	.....
Heifers, per cwt.	.....	.....
Cows, per cwt.	.....	.....
Wheat, per bu.	.....	.....
Oats, per bu.	.....	.....
Corn, per bu.	.....	.....

The teacher should assist and encourage the students of his school in making a weekly produce and grain chart of the local and city market price of all the farm products of his school district. Any good daily or weekly paper will give the city market prices, while the county paper will give the local or home prices.

This chart should be tacked on the wall of the school room in a place where all the students can read it. Once a week a new one should be made, the students reporting the market prices.

The child who grows up to be a farmer, not accustomed to read and study the markets, will never be in a position to command the highest prices for his products. He must know the markets to know how to buy and sell intelligently.

PRODUCE

1. Find the amount of:

3 dozen eggs	@	18c
5 pounds of butter	@	20c
10 pounds of honey	@	12½c

2. Find sum due a lady who

Sells:

6 dozen eggs	@	12c
30 pounds of chickens	@	8c
35 pounds of dried fruit	@	4½c

Buys:

3 pounds of coffee	@	20c
1 gallon of syrup	@	60c
2 gallons of oil	@	15c
8 pounds of rice	@	6c
10 yards of gingham	@	8⅓c

3. Keep count of the eggs laid each month and their value at store prices. Keep count of the pounds of

butter made each month and its value at store prices.

4. Keep an accurate account of all your family expenditures and receipts. At the end of each month see which is the larger.

LIQUID MEASURE

231 cu. in. make a gallon.

1. Make a box whose inside measurements are 11 inches by 7 inches by 3 inches. Fill the box level full of sand then pour into a pail and mark the depth of the sand. This may be used as a gallon measure.

2. Using your marked bucket as a measure, find the capacity of several different buckets.

SOIL EROSION

1. Ordinary sand stone will hold 1-20 of its bulk of water. How many gallons of water is in a bed of sand stone underlying a 5 acre field, if it is 10 feet thick and soaked with water?

2. After a heavy summer rain the water of a small stream contained one pound of sediment for every 500 gallons of water. If the rainfall was one inch and the area of the basin drained was 4 square miles and the amount of water that ran off was ¼ of all that fell, how much soil did the rain carry away?

3. After a heavy rain the water of a small stream that drained a meadow contained one pound of sediment for every 2,000 gallons of water. If the rainfall was 2 inches, and ¼ of all the water that fell ran off, how much soil was carried away from a 40 acre meadow?

4. If the water running from a corned piece of land contained one pound of sediment for every 250 gallons of water, how much soil was carried away from a 40 acre cornfield after a two inch rain, ¼ of the water running off?

LAND MEASURE

1. Measure a rod on the school yard and mark with two firmly set stones or stakes.

2. Give the class a drill in judging a rod.

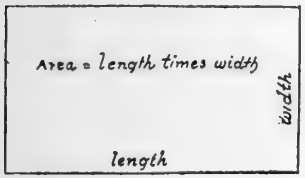
3. Measure a mile on the road passing the school house and set up a mile post. Encourage the students to set up mile posts on all the roads in the community.

4. Lay off 300 feet by accurate measurement; set up stakes at each end, have the older students to walk this distance several times, noting the number of steps required each time. From this determine the length in inches of the step of each student.

5. Ask the students to count the steps in walking a mile and approximate the number of yards to the mile.

6. Lay off a square rod on the school yard and mark with four firmly set stakes.

7. By stepping, approximate a mile. How far it is from your home to your nearest neighbor's?



A rectangular field is one bounded by four straight lines, having four square corners. An acre contains 160 square rods.

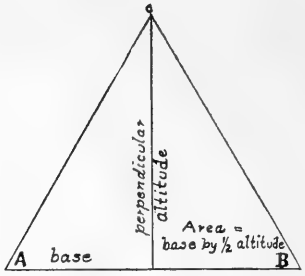
8. Lay off an acre of land in the form of a rectangle near your school house and mark with stakes.

9. How many acres in a rectangular field 80 rods long and 60 rods wide?

10. What must be the width of a rectangular field 80 rods long to contain 25 acres?

A triangular field is one bounded by three straight lines.

The altitude of a triangle is the perpendicular distance between the base of the triangle and the highest point opposite it.



Lines are perpendicular (⊥) to each other whenever they meet forming a square corner.

To measure the altitude of a triangular field, measure the perpendicular distance from one corner of the field to the opposite side.

11. How many acres in a triangular field the longest side of which is 60 rods, and the altitude from the opposite corner to this side is 35 rods?

To measure a field in the shape of a triangle, measure the distance of the longest side in rods, to this side from the opposite corner measure the perpendicular distance (the altitude) and multiply the longest side in rods by the altitude in rods, take ½ of the product, and divide by 160 to find the number of acres.

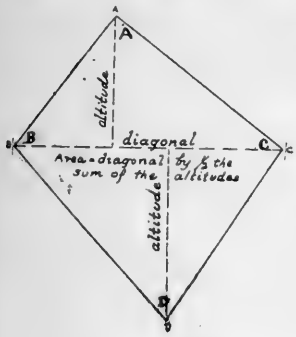
12. Stake off a small triangular field, measure the longest side and the altitude from the corner opposite this side and estimate the number of acres, first by stepping; then by measuring.

13. Select a triangular field near the school house, measure it and estimate the number of acres it contains.

14. A farmer has two rectangular pieces of land to fence, one is 40 rods long and 40 rods wide; the other 80 rods long and 20 rods wide. How much will it cost to fence each at 25c per rod? Which field is the larger?

To measure the acres in an irregular, four-sided field

measure the diagonal (the distance from one corner to the opposite corner,) also the altitude of each triangle from the opposite corner to the diagonal and multiply the diagonal in rods by ½ the sum of the altitudes, and divide by 160 to find the number of acres.



15. Select an irregular four-sided field near the school house and estimate the number of acres it contains.

16. How many apple trees may be set on an acre of ground, if the trees are put 30 feet apart each way?

Barbed wire is sold by the spool, the average size spool weighs 100 pounds.

One pound of barbed wire averages 12 feet in length.

A pound of staples contains 100.

17. How many spools of wire and pounds of staples must be bought for 80 rods of fence 3 wires high, the posts being 12 feet apart?

18. With wire at $3.00 per 100, staples at 4c per pound, estimate the cost of the wire and staples required to build three quarters of a mile of fence 4 wires high.

SPRAYING ORCHARDS

Blight, rot, and scab are fungus diseases of orchards which decrease the yield and quality of the fruit grown.

1. In the spring of 1910 The Kentucky Experiment Station took for a subject for demonstration an orchard in Hardin Co. which had never been sprayed. A single row of trees extending through the orchard was sprayed twice with Bordeaux mixture; once immediately following the blooming period, and again twelve days later. One sprayed

Maiden Blush tree yielded 7 bushels of apples, 4½ bushels of which graded 'firsts,' the remainder 'seconds.' One unsprayed tree of the same variety in the next row yielded 4 bushels of apples, ½ bushel of which graded 'first.' When 'firsts' were selling at 80c per bushel and 'seconds' at 40c, what is the difference in the market value of the fruit grown on each tree?

2. Counting the yield and the quality of the fruit in the above the average for sprayed and unsprayed trees, what will be the difference in yield in two orchards of 150 trees each, one sprayed twice, the other unsprayed? What will be the difference in their value, 'firsts' selling at 50c per bushel, 'seconds' at 25c per bushel?

The mixture used by the Kentucky Experiment Station consisted of 4 pounds of lime, 4 pounds of bluestone and 3 pounds of arsenate of lead paste to 50 gallons of water.

3. Lime at 1c per pound, bluestone at 10c per pound and arsenate of lead paste at 20c per pound, averaging two gallons of the mixture to a tree for a single spray, what would be the cost of spraying 100 apple trees twice?

4. If the apple orchard mentioned in problem 1 consisted of ten acres, with the trees set in rows 30 feet apart, the trees in the row the same distance apart, what would be the cost of the material for spraying the orchard twice? What would be the worth of the increased yield when apples of the first grade sold for 60c per bu., second grade at 30c per bushel?

5. What would be the cost of the material required to spray an orchard of 50 trees twice?

MILL PROBLEMS

One bushel, 60 pounds, of average wheat makes 40 pounds of the best grade flour. As a rule, millers take as

toll 1-8 of the flour with the screenings and bran.

1. How many bushels of wheat will it take to make 100 pounds of the best grade flour?

2. How many bushels of flour of the best grade should a farmer get in exchange for 8 bushels of good wheat?

3. Which is the cheaper, for a farmer to sell his wheat at $1 per bu. and buy his flour at $2.75 per hundred, or exchange his wheat for flour, receiving 34 pounds to the bushel?

Roller mills usually double clean and bolt corn meal. One bushel, 56 pounds, of good corn makes 48 pounds of meal. They usually take as toll about 1-5 of the corn or give from 38 to 40 pounds of meal to the bushel.

4. How many pounds of bolted meal will 5 bushels of corn make?

5. When a miller gives 38 pounds of meal in exchange for a bushel of corn, how many pounds should a man receive for 2 ½ bushels of corn?

6. When a miller gives 40 pounds of meal in exchange for a bushel of corn, how many bushels of corn must be taken to mill to exchange for 140 pounds of meal?

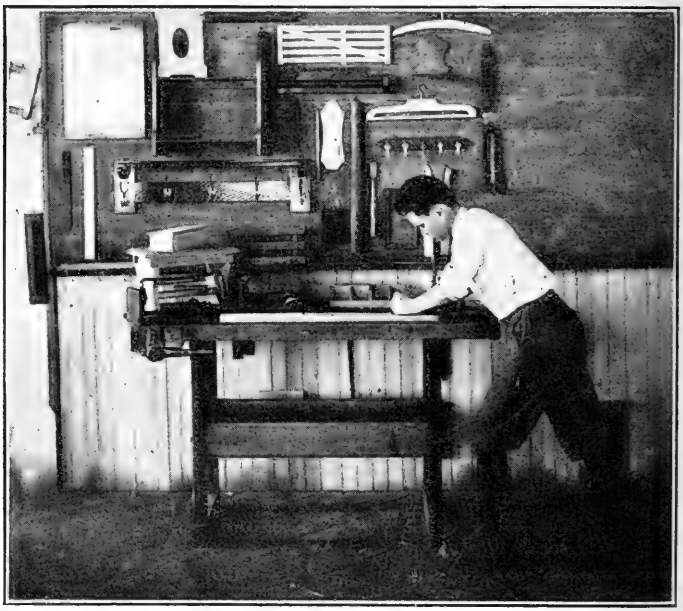
7. Which is the cheaper, for a farmer to sell his corn for 75c per bu., and buy meal at 40c for 25 pounds, or exchange his corn for meal, receiving 38 pounds to the bushel?

The grist mill grinds without bolting.

A bushel of corn makes 55 pounds of meal, from 1-6 to 1-8 is taken as toll.

8. A grist mill that takes ⅛ as toll gives a customer how many pounds of meal in exchange for 1½ bushels of corn?

9. How much corn must a man take to a grist mill that takes 1-6 for grinding, so that he may have 65 pounds of meal?



TRAINING FOR THE HEAD AND THE HAND

1. This seventh grade boy made these articles in his first 36, one hour lessons in woodwork. He sold the hat rack for $1.00, book shelf for 50 cts., checkerboard for 25 cts., two picture frames for 25 cts. each, foot stool for 50 cts., two coat hooks for 20 cts. each, handkerchief box for 30 cts., singletree for 10 cts., and two hammer handles for 10 cts. each. How much did he earn while reciting his 36 lessons?

2. This boy working at odd times during a six months school made a bookcase for which he received $15. How much did he earn each month while learning Geography, History, Grammar and Arithmetic?

3. Estimating the value of training a boy how to

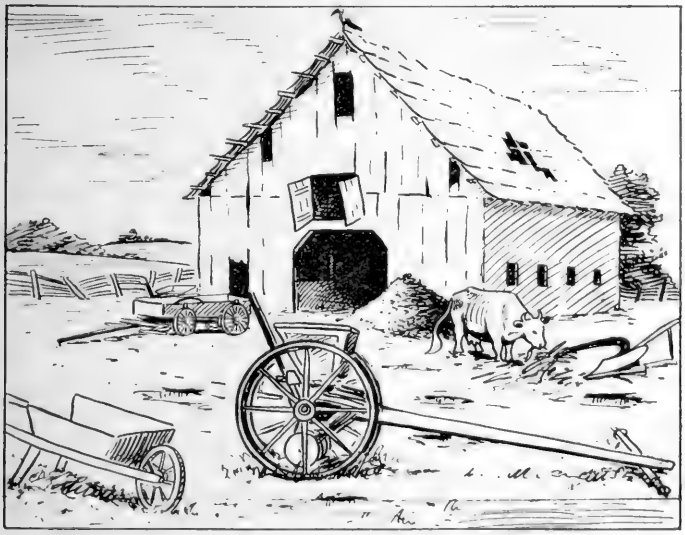
handle and care for tools at 10 cts. for each work day he lives, what is this training worth to a man in the course of 40 years?

4. It is estimated by a teacher of carpentry that the boy without training in using tools wastes 2 inches on the length of a board for each cut he makes with the saw. Estimate the loss on 100 cuts of six inch lumber selling at $3.00 per hundred.

IDLENESS AND CARELESSNESS

1. How much does a man lose who idles away 140 work days each year, when wages are 75c a day with board?

2. In a family of five children of school age only one attends school regularly. How much of the state's school fund does the family lose when the state pays $4.40 a year for the education of each child?



CARELESSNESS AND WASTE OF MACHINERY

3. Two classmates in a country school leave the district school, one to work for 75c a day with board; the other borrows $250 and goes away three years to a trade school and learns a trade which pays him $1.75 a day with board. Counting each able to average 285 work days a year, which will have earned the most at the end of ten years from the time they leave the district school?

4. A self-binder that sold for $125 was left out in the weather by a hardware merchant for a period of 2 years, and then sold for $50. What did his carelessness cost him?

5. A farm wagon with ordinary usage kept under shelter when not in use will last about 15 years. When not sheltered it will last about one-half as long. What is the average loss per year on a $65 wagon that stands out in the weather?

6. If a hired hand while cultivating young corn covers up ten hills to the acre, what is the value of the corn destroyed, counting two ears to the hill, and 100 ears to the bushel, at 60c per bushel?

7. If the hired hand cultivates 3½ acres per day, what is the actual cost to the farmer for a day's work when the hired help is paid 75 cents per day?

8. Read in some good book for 30 minutes and count the words read. How many is this per hour?

9. Counting 400 pages an average sized book with 400 words to the page, how many good books could you read each year at your present rate of reading by reading one hour each day?

10. How many books have you read? Counting 400 pages to the book, how many hours have you spent reading good books?

EDUCATED LABOR

A business man who studied the productive power of intelligent labor in New York reports that the man with a common school education is able to produce 1½ times as much wealth as the illiterate man, the high school man 2 times as much, and the college man 4 times as much.

1. The farm hand who is scarcely able to read and write is able to earn $16 a month. If he had a common school education he should earn how much more in a period of 30 years?

2. If a laborer who signs his name with a "mark" is able to accumulate $3000 in 20 years, with a common school education he should have accumulated how much in the same time?

3. If a farmer by reading farm papers and books on farming 30 minutes each day can grow two bushels more grain per acre, at the present price of corn, wheat, and oats, how much does he realize on his reading in growing 20 acres of corn, 10 acres of oats and 20 acres of wheat? Counting 10 hours a day's work what does he receive for a day's reading?

THE VALUE OF BIRDS TO FARMERS

Mr. Beal, of the U. S. Biological Survey, once estimated that the tree sparrow in a single season in the state of Iowa ate 1,750,000 pounds of weed seed.

1. Counting that 15 pounds of weed seed will sow an acre, how many acres of weeds would the seed eaten by the tree sparrow in Iowa alone have sown? Paying 65c an acre for cutting, raking and burning the weeds, what would it have cost the farmers of Iowa to destroy the weeds?

Mr. Chester A. Reed, of Mass., estimates that on an

average each bird will eat daily for about 5 months in the year, from May to September inclusive, 100 harmful insects. He also estimates 120,000 insects to the bushel.

2. Counting 5 insect eating birds to the acre, how many bushels of insects will the birds on an average sized farm in your community destroy during 5 months?

3. How many cut worms, grubs and harmful insects will a flock of 50 birds that follow the plow daily for two weeks destroy?

4. If two out of every 100 insects and worms destroyed are either cut worms or grubs (these are the destroyers of young corn) and counting a grub-worm and cut-worm each to destroy on an average 3 corn plants; what are the 50 birds following the plow for two weeks worth, when corn is 50c per bushel, counting one good ear to each plant destroyed?

5. If a quail eats in the course of a year as much as 25c worth of grain and destroyes $5 worth of harmful insects and weed seed, counting that a pair of quails raise a brood of twelve each year, how much has a farmer injured himself by killing three pairs?

WHAT IT COSTS TO GROW CORN

1. Estimate the cost of growing a 15 acre field of corn when,

(1) A man with a two-horse plow can break 1½ acres a day,

(2) A man with a one-horse plow can lay off 8 acres a day,

(3) A man and double shovel can cultivate 4 acres a day,

(4) A man can plant 8 acres a day, (5) A man can hoe 1 acre a day,

(6) The corn to be cultivated three times,
(7) The corn to be hoed two times, (8) A man with team and wagon with two helpers can gather three acres a day,
(9) Man and team to be paid $2.00 a day and given two meals,
(10) Man and horse to be paid $1.00 a day and given two meals,
(11) Man working alone to be paid 75 cents a day and given two meals,
(12) Meals for man counted at 15 cents, for horse 10c.

2. Counting 25 bushels per acre, what was the cost per bushel to grow corn in problem 1?

3. At the present price of corn, which is the better for the renter; to give the third or pay $2.00 cash per acre and take all the corn?

4. The conditions stated above hold for a county whose corn crop averaged 17½ bushels per acre for the year 1911. What was the average cost of growing each bushel of corn?

ESTIMATING CROPS IN THE BULK

Corn

Approximately 3¼ cu. ft. of corn in the husk makes a bushel.

The capacity of a crib in bushels equals the product of the length, width and depth in feet divided by 3¼.

1. How many bushels of corn in the husk in a crib 12 ft. long, 8 ft. wide and 7 ft. high?

2. How many bushels in the husk will a rail pen 7½ ft. in the clear and 9 ft. high hold?

3. Measure the crib at home and estimate how many bushels it will hold. How many bushels in it now?

4. Measure the wagon box at home and estimate the number of bushels it will hold.

5. How high must a crib 10 ft. long, 8 ft. wide be built to hold 150 bu.?

To find the number of bushels of corn in the husk in a round pile, square ½ the distance across the pile in feet and multiply by 3 1-7, then by ½ the height of the pile in feet and divide by 3¼.

6. How many bushels of corn in the husk in a round pile 12 ft. across, tapering to a point 6 ft. high in the middle?

Approximately 2½ cu. ft. of corn on the cob makes a bushel. The capacity of a crib of corn on the cob equals the product of the width by the length by the depth in feet divided by 2½.

7. How many bushels of ear corn will a wagon bed hold, that is 10 ft. long, 3 ft. wide, and 26 in. deep?

8. How many bushels of corn in the husk will the crib at home hold? On the cob?

2150.4 cu. in. makes a bushel of shelled corn.

9. How many bushels of shelled corn will your father's wagon box hold?

Hay

A ton of packed timothy hay is about 512 cu. ft.; of clover hay 450 cu. ft.

The capacity of a hay loft in tons equals the product of the length, width, and height in feet, divided by 512 for timothy; 450 for clover.

1. How many tons of timothy hay in a loft 30 ft. long, 24 ft. wide, with an average depth of 7 ft.?

2. Measure and estimate the number of tons of timothy hay that your barn will hold.

3. How many tons of clover hay can be stored in a place 15 ft. long, 12 ft. wide and 6 ft. deep.

To approximate the number of tons in a stack, square ¼ of the distance around the stack, measured at a point half way from the ground to the top, and multiply this by the height of the stack in feet, and divide by 512 if timothy hay or any other coarse hay; by 350 if prairie or any other fine, clean hay.

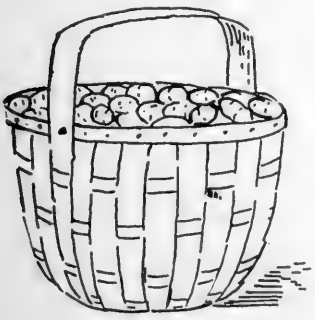
4. Measure a number of hay stacks in the neighborhood and approximate the number of tons in each stack.

5. Measure one of your father's or neighbor's haystacks and estimate its worth at the local price of hay.

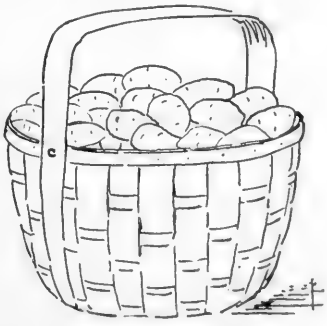
6. Measure one of your father's haystacks and estimate how many days it will feed a cow, when fed 84 lbs. a week.

Apples and Potatoes

Apples and potatoes are measured by heaped bushels (2,747.7 cu. in.) but for practical purposes it is sufficiently accurate to take 1 3-5 cu. ft. as a bushel.



Stricken Measure



Heaped Measure

1. How many bushels of potatoes in a wagon bed 10 ft. long, 3 ft. wide and 16 in. deep?

2. How many bushels of apples can you put in a box 4 feet long, 3 feet wide and 2 feet deep?

To find the number of bushels in a round pile of apples, potatoes, etc., square ½ the distance across the pile in feet, multiply by 3 1-7, then by ½ the height of the pile in feet and take ⅝ of the product.

3. When potatoes are selling at 50c per bushel, what is the value of a round pile 10 feet across and tapering to a point 5 feet from the ground?

4. How many bushels of apples in a round pile 12 feet across and tapering to a point 6 feet high from the ground?

5. Measure and estimate the bushels of apples, potatoes, turnips, etc., holed up at home.

6. How many bushels will a wagon bed 10 feet long, 3 feet wide and 2 feet deep hold?

TAX UPON THE SOIL BY DIFFERENT CROPS

Nitrogen, Phosphoric acid and Potash are plant foods contained in the soil. They are extracted from the soil in different proportions by different crops. Clover, cow peas, and a few other crops draw their nitrogen from the air and save the soil that much.

The following table will give some idea of crop requirements per acre:

Crops	Straw	Grain	Nitrogen	Phos. acid	Potash
Corn	5000	35 bu.	72 lbs.	28 lbs.	82 lbs.
Wheat	1500-3000	15-30	31-62	10-20	10-20
Oats	1600-3200	30-60	35-70	11-22	25-50
Potatoes		100-200	16-32	10-20	31-62
Clover	2000-4000	.....	.....	9-18	44-88
Peas	.....	30	.....	18	22

1. How many pounds of plant food are required to grow 18 acres of corn, averaging 35 bushels per acre?

2. How many pounds of plant food are required to grow 18 acres of clover, averaging 2 tons per acre?

3. What is the tax upon the soil in growing a 50 acre field of wheat, averaging 15 bushels per acre? 30 bushels per acre?

4. What is the value of the plant food removed from the soil in growing 35 bushels of corn, nitrogen being quoted in the market at 22c a pound, Phosphoric acid 5c and Potash 6c?

5 A father tells his son that he may have all the wheat he can grow on a 10 acre field if he will pay, at commercial prices, (see problem 4) for the plant food removed from the soil; if the son grows 15 bu. per acre, how much does he owe his father?

THE COST OF RESTORING PLANT FOOD TO THE SOIL

Nitrogen, Phosphoric acid, and Potash may be returned to the soil by means of commercial fertilizer, straw, and manures.

This table gives some idea of how plant food may be returned to the soil, and what it is worth per ton at commercial prices.

Nitrogen 22c per pound; Potash 6c; and Phosphoric acid 5c.

Students should complete the table with values based on commercial prices, and make a duplicate copy on a large piece of pasteboard and give to their parents for inspection and for future reference.

NAME OF MATERIAL	LBS. PER TON			MARKET VALUE PER TON			
	Nitrogen	Phos. acid	Potash	Nitrogen	Phos. acid	Potash	Total Value
Fresh farm Manure	10	5	10	$2.20	$ .25	$ .60	$3.05
Barn yard Manure	10	5	10	...	...	...	...
Corn fodder	12	9	39	...	...	...	...
Oat straw	12	6	33	...	...	...	...
Wheat straw	10	5	14	...	...	...	...
Clover hay	40	13	30	...	...	...	...
Cow peas	43	13	33	...	...	...	...
Red clover in flower	40	12	37	...	...	...	...
Red clover Ripe	25	9	20	...	...	...	...
Average Complete Commercial Fertilizer	33	33	33	...	...	...	...

1. What is the loss in plant food to a farmer who burns a straw stack weighing 20 tons?

2. How much plant food does a farmer sell when selling the fodder off a 10 acre field averaging 35 bushels per acre?

3. What is the value of the plant food returned to the soil when 25 acres of clover, averaging 1¼ tons per acre, is plowed under?

4. How does the value of a ton of fresh farm manure compare with a ton of cow peas plowed under for fertilizer?

5. How does a ton of barnyard manure compare with a ton of wheat straw in soil fertility?

A ton of fresh manure shrinks in weight ½ during the first six months when exposed to the weather.

6. What is the loss on 10 tons of piled manure exposed 6 or more months? Make an estimate on commercial value of plant food given in table.

7. What is the value of the plant food in the corn stalks of an acre when the stalks weigh 3500 pounds?

8. It is estimated that a 1000 pound steer during the process of fattening makes 1½ tons of manure per month. What is the value of the manure from a herd of 20 for three months?

9. Which brand of fertilizer should a man buy to get the most for his money: one which analyzes 33 pounds of nitrogen, 160 pounds of phosphoric acid, and 14 pounds of potash to the ton and sells for $32.00, or one which analyzes 20 pounds of nitrogen, 120 pounds of phosphoric acid, and 80 pounds of potash, and sells for $24.00 per ton?

10. How much does a farmer receive for the fodder on an acre of checked corn at 20c a shock, the shocks being 16 hills square?

11. Find in dollars and cents the fertilizing value of a ton of corn fodder.

12. Counting 2 tons the average amount of corn fodder per acre, what is the fertilizing value of the stalks on a 20 acre field? How much is the self robbery to the farmer who would burn the stalks on this corn field?

13. What is the fertilizing value of a ton of commercial fertilizer that contains 33 pounds of nitrogen, 180 pounds of phosphoric acid, and 140 pounds of potash?

14. What is the difference in the fertilizing value of a ton of commercial fertilizer that analyzes 66 pounds of nitrogen, 160 pounds of phosphoric acid, 80 pounds of potash, and one that analyzes 20 pounds of nitrogen, 220 pounds of phosphoric acid, and 30 pounds of potash?

CROP ROTATION

1. Which would be the better; to corn a 35 acre field 5 years straight with an average yield of 20 bushels, corn at 60c, or to put it in corn the first year with a yield of 25

bushels per acre at 60c per bushel; the second year in wheat 15 bushels per acre at 95c per bushel; the third year in clover, the first crop averaging 1 ton per acre at $10 per ton with the second crop used as pasture and turned under for plant food; the fourth year to wheat averaging 20 bushels at 95c per bushel; the fifth year to corn averaging 50 bushels at 60c?

2. Why should crops rotate?

3. Why should clover or cow peas be sown every few years?

4. Explain the following crop rotations:

Corn, oats, wheat, clover.
Corn, wheat, clover.
Corn, oats, wheat, grass.
Corn, oats, rye, grass.

SELECTING SEED CORN

1. In Homes county, Mississippi, in 1909 the members of the boys corn club grew corn averaging 76 bushels per acre. The corn grown by their fathers and neighbors averaged 16 bushels per acre. When corn was selling at 50c per bushel, how much smarter to the acre were the boys than their neighbors?

What The Boys Know About Selecting Their Seed

1. The ear should be selected in the fall from the stalk.

2. The ear should be firm.

3. The ear should be cylindrical in shape.

4. The ratio of the circumference to the length about 3 to 4.

5. The butt should be rounded out around a cup-shaped cavity.

6. The shank should be medium size.

7. The tip should be filled out with deep kernels in as regular rows as possible.

8. The kernel should be uniform in size and shape, but not pointed.

9. The furrows between the rows should be narrow with kernels fitting closely together at the top.

10. At least 4-5 of the weight should be corn. From 80 to 100 average ears should weigh 70 pounds.

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1. How many hills of corn are planted to the acre when the rows are 3 feet 6 inches apart, the hills in the row being the same distance apart?

2. How many stalks to the acre with an average of two to the hill? Three to the hill?

3. Seed corn will average 800 grains to the ear. How many ears will it take to plant an acre, when the rows are 3 feet 6 inches apart, the hills in the rows the same distance apart, planting two grains to the hill? Planting three grains to the hill?

4. What is the average yield per acre in your neighborhood? County?

5. Averaging one ear to the hill, such that 100 ears make a bushel, what would be the yield per acre?

6. Which will produce the greater yield per acre, two ears to the hill, such that 100 make a bushel, or three ears to the hill such that it takes 190 ears to make a bushel?

7. If the farmer can increase the weight of each ear of corn two ounces by proper selection of seed in the fall, what will the increase amount to on a 30 acre field averaging 6,480 stalks per acre, with one ear for each stalk, corn selling at 50c per bushel?

8. When corn sells at 50c per bushel, what is the loss to a farmer for each bad ear of seed planted, counting 800 grains of corn to the ear, each grain planted averaging one good ear, such that 100 make a bushel?

9. If 12 ears of properly selected seed corn will plant an acre, how many ears will it take for a rectangular field 64 rods by 30 rods?

10. A farmer spends two days in selecting seed corn for a five acre field. If the increase in yield is five bushels per acre, what wages does he make at the present price of corn?

Corn shrinks about 1-5 of its entire weight during the first 6 months following gathering time.

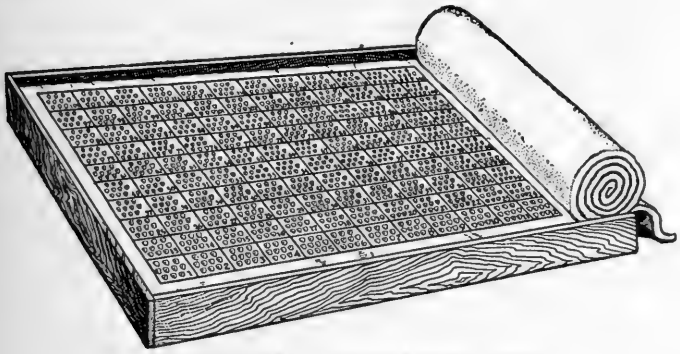
11. 1,200 bushels of corn at gathering time should weigh approximately how many the first of the following May?

12. A man is offered 50c a bushel at gathering time. He holds it six months and sells at 60c a bushel; how much does he gain or lose by holding a crop of 600 bushels?

13. A man is offered at gathering time 60c per bushel. How much must he receive per bushel to neither lose nor gain by selling in the spring?

TESTING SEED CORN

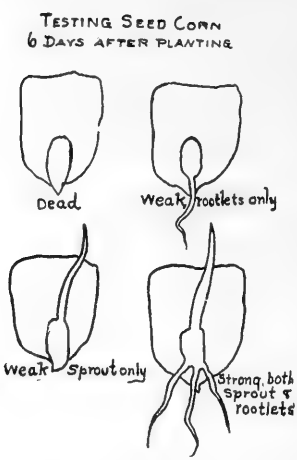
Corn selected for seed should be tested before planting. This can be done by making a box 36 by 40 inches, and two or three inches deep. Fill the box about half full of moist dirt, sand or sawdust. Press it down so that it will have a smooth even surface.



TESTING SEED CORN FOR TEN ACRES

Take a white cloth about the size of the box, rule it off into squares two or three inches each way, number them 1, 2, 3, 4, etc., and place it in the box upon the sand. Take flour sacks, pad them with an inch or two of moist sand or sawdust.

Carefully remove five or six grains from each ear, place them in the numbered squares corresponding to the num-



bers on the ears, and cover with the flour sack pad. Place the box in a warm place where it will not chill. Keep the pad well dampened and warm, and in five or six days remove the pads carefully. Select for seed those ears whose grains have both sprouts and rootlets.

1. When corn is selling at 75c a bushel, what is a farmer's loss by planting one bad ear of seed corn?

2. When corn is selling at 60c a bushel, what is the loss to a neighborhood by planting 50 bad ears of seed corn?

3. A farmer by planting only tested corn may depend upon an increase of 5 bushels per acre. If your father did not test his seed last spring estimate his loss at the present price of corn.

4. The children of the public schools can do all the testing for their own district. Find out how many acres of corn were planted in your district last year; and estimate at the present price of corn how much your school could have earned for your neighborhood by testing their seed corn.

FEED PROBLEMS

70 pounds of husked corn make a bushel.

Weigh 70 pounds of average ears and count the number in a bushel. Good corn should not average more than 100 ears to the bushel.

1. What is the cost of feeding a work team during January, 20 ears of corn at a feed (100 ears to the bushel) at 75c a bushel and 32 pounds of timothy hay daily at $12 per ton?

2. At the present price of corn and fodder what does it cost your father to keep a team of work horses during December?

3. What is the cost of feeding a milch cow during January, 10 pounds of shipped feed daily at $1.40 per hundred, 4 pounds of cotton seed meal at $2.00 per hundred, and 12 pounds of clover hay at $15 per ton?

4. If the cow in problem 3 gives 2 gallons of milk daily, does she pay for her feed when milk sells for 6c per quart?

5. Ask each student to keep an itemized account of the feed fed to at least one cow and one horse during one feed month. Estimate the cost of the feed at local prices.

Every 100 pounds of rich milk contains from 2 to 6 pounds of butter. 8½ pounds of milk to the gallon is considered accurate enough for practical purposes.

6. A jersey cow that gives 1½ gal. of milk at a milking gives how many pounds of milk during the year? If 4% of her milk is butter how many pounds of butter does she produce in a year?

7. A cow giving 2½ gal. of milk daily tests 4½% of butter. Her owner is offered 25c per pound for the butter and 10c per gal. for the skimmed milk, or 6c per quart for the fresh milk; which is the better proposition?

8. A cow when fed 1 bu. of corn and 1 shock of fodder every 5 days gave 1 gal. 1 pint of milk a day; when fed each day 8 pounds of corn and 3 pounds of oats crushed together and 15 pounds of clover hay, gave 3 gallons a day. If the cow's milk weighs 8½ pounds to the gallon and tests 4% butter (4 pounds of butter for each 100 pounds of

milk) how much butter will she produce in 90 days when fed on corn and fodder? How much when fed on good rations for a dairy cow?

9. At present prices of feed, what is the difference in cost of the two methods of feeding for the period of 90 days? What is the difference in the butter produced in the the same period at market price?

MEAT PROBLEMS

Butchers count on a loss in butchering hogs of 25 pounds on the first 100 pounds, 15 on the second, and 10 on each additional hundred. Country cured meat shrinks 1-3 of its weight. Packing houses employ methods of curing meat with practically no shrinkage.

1. What is the waste in butchering a hog weighing 350 pounds?

2. A farmer butchered a hog weighing 283 pounds and cut it up as follows:

Head, 20 lbs.	Lard and sausage, 63 lbs.
Backbone, 13½ lbs.	2 hams, each 37½ lbs.
Spare ribs 8 lbs.	2 shoulders each 37½ lbs.
Feet & Hocks, 6½ lbs.	2 sides each 43½ lbs.

Which would have been the more profitable, to have sold the hog on foot at the market price, 6c per pound, or to salt and smoke the saleable meat and sell at the local price of country cured meat?

3. Which is better for a farmer to sell fresh meat as follows:

4 hams averaging 32 pounds at 10c
4 shoulders averaging 27 pounds at 10c
4 sides averaging 28 pounds at 10c;

or

To country cure and sell the hams and shoulders at

15c per lb. and the sides at 12½c per pound?

4. A butcher pays 5c a pound for a hog weighing 139 pounds. Butchered it cut up into 48 pounds of cutting meat, selling at 12½c per pound; 9 pounds of bacon, selling at 10c a pound; 30 pounds of lard at 10c; 2½ pounds of ribs at 12½c; 12 pounds of head at 6c. How much does the butcher make?

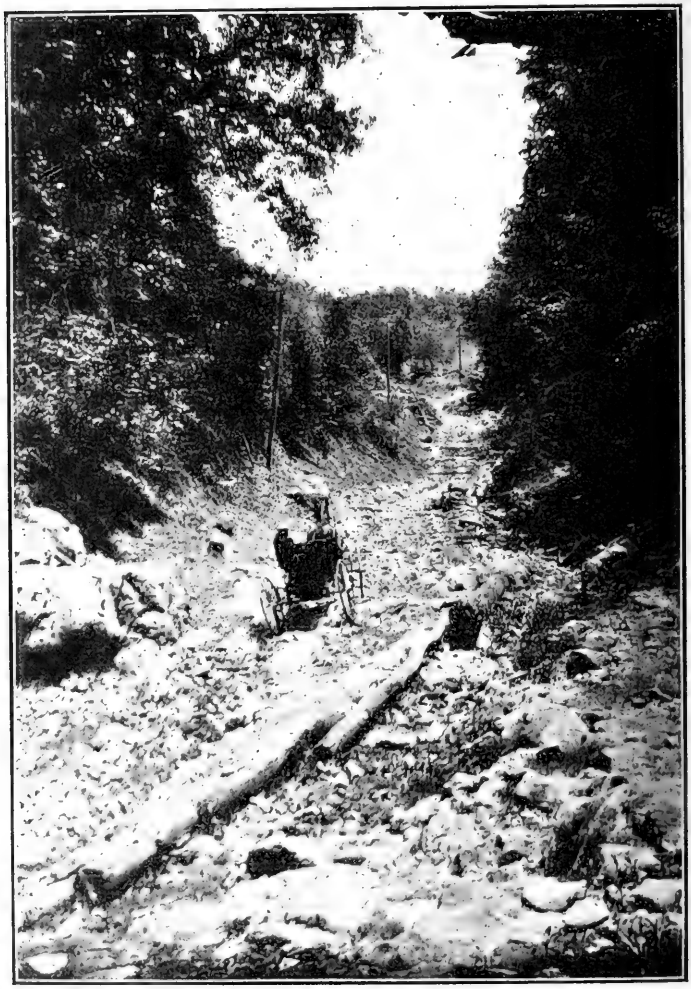
5. At butchering time a farmer can sell his hams at 9c per pound. If 1-3 is lost in curing meat, what price should he receive for the meat when cured that he may neither lose nor gain?

THE COST OF BAD ROADS AND WHO PAYS IT

1. A town is 55 miles from the nearest railroad point. The roads are such that the average load hauled is 1600

WHEN AN EMPTY WAGON IS A LOAD.

pounds. The average time required for a roundtrip is 8 days. The price for drayage from town to railroad point



THIS HILL MAKES THE FREIGHT ON THIS ROAD TWO CENTS PER MILE FOR EACH HUNDRED POUNDS

is $1. per hundred, from railroad to town is $1.50. How much does the freighter receive for a round trip when loaded each way? How much per day?

2. If the road was piked the round trip could be made in 4 days, hauling 2500 pounds each way. If the freighter is to receive the same per day for his work as in problem 1, what must be his average charge per hundred?

3. Counting that 100 pounds of flour will last a family of six for two months, eating white bread once a day, what will the freight amount to on the flour used by them in a year using white bread once a day; twice a day, paying freight rates in problem 1?

4. How much would a good road save the family on flour alone, paying the freight rate in problem 2?

5. If the freight to the above town is 416,000 pounds each year, what is the freightage at $1.25 per hundred; at 60 cents per hundred? What is the saving in a year at the reduced rate due to good roads?

6. How many years will it take the difference in freight rates in problem 5 to build 20 miles of piked road at $1000 per mile?

7. A hardware dealer estimates the life of a freight wagon at one year of continued service on the road described in problem 1. If it takes 8 days for a round trip, how many miles of service in a new wagon?

8. Counting 3 years the life time of a freight wagon on a piked road, when wagons sell at $60, what is the bad road tax paid by a freighter in the course of 6 years on the road in problem 1?

9. A country store situated on a piked road pays 1 cent a mile for each hundred pounds of freight hauled from the railroad station; a county seat located on the same

On this Road Freight is one cent per mile for each Hundred pounds.

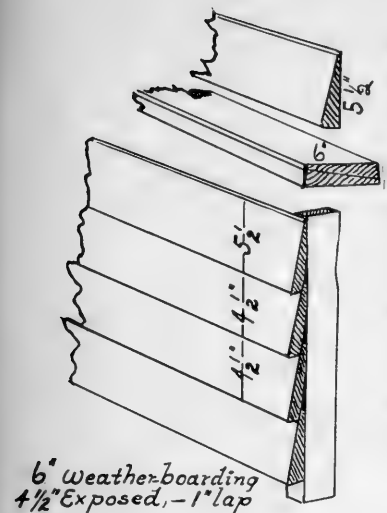
road 24 miles from the railroad, 18 miles of which are not piked, pays 2 cents a mile for hauling each one hundred pounds of freight. What is the annual bad road tax paid by this county seat town upon 300,000 pounds of freight.

10. It is estimated by good authority, that a certain county in Kentucky, which pays out annually $70,000 for hauling its goods from the railroad could save at least $40,000 annually by having good roads. What is the average bad road tax upon each of the 17,789 farmers in the county?

WEATHER-BOARDING

Weather-boarding is sold by the width of the boards from which it is dressed. A board 6 inches wide dresses into weather-boarding 5½ inches wide. A 5 inch board into 4½ inch weather-boarding. In weather-boarding 1 inch is allowed for lap. To estimate a bill of weather-boarding, measure the surface in square feet, to this add its one-third if 6 inch weather-boarding; two-sevenths if 5 inch. Ordinarily, no allowance is made for doors and windows.

1. How many square feet on one side of your school house? How many square feet of 6 inch weather-boarding would it require? How many feet of 5 inch weather-boarding?



2. How many square feet of weather-boarding would it take for the school house?

3. Paying 2 men $1.75 each for putting on together 600 square feet of weather-boarding a day, what would be the carpenter bill for weather-boarding the whole house? The lumber bill with weather-boarding at $2.75 per hundred? The total?

4. Paying $1.50 for each 300 feet of weather-boarding placed on, with $2.50 per hundred for weather-boarding and nails, what would it cost to weather-board a house the dimensions of your home?

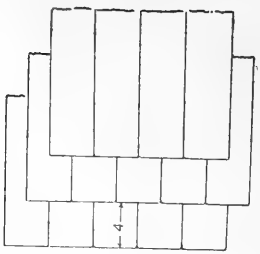
5. In 6 inch weather-boarding, how many inches are exposed to the weather?

6. When a carpenter is estimating the number of feet of weather-boarding required for a building, why does he add to the number of square feet to be covered its one-third when 6 inch weather-boarding is used?

SHINGLING

It requires 900 shingles that average 4 in. wide, laid 4 in. to the weather, to cover 100 square feet; but to allow for waste, count 1,000 shingles for 100 square feet.

There are 250 standard size shingles in a bunch,



4 bunches of shingles will cover 100 square feet.

A fractional part of a bunch can not be bought.

Allow 6 pounds of shingle nails for each thousand shingles.

Carrying up and laying 6 bunches (1,500 shingles) is a day's work for the average carpenter.

1. How many bunches of shingles averaging 4 in. wide and laid 4 in. to the weather will it take for the roof of the school house?

2. Paying the carpenter $2 a day, with shingles at $3 per 1,000, nails at 3c per pound, what will it cost to put a new roof on the school house?

3. Paying a carpenter $1.50 per day, with shingles at $3.25 per 1,000, nails 4c per pound, what would it cost to put a new roof on your home?

METAL ROOFING

Metal Roofing is bought by the square (100 sq. ft). Galvanized steel can be bought at from $2.50 to $4.00 per square, 75c is the average charge for laying. Galvanized iron can be bought at $4 per square, 75c is the average charge for laying. Tin roofing can be bought at from $2 to $6 per square, $1.50 is the average charge for laying.

1. What would a galvanized steel roof, at $3.00 per square, at 75c per square for laying, cost for your school house?

2. What would a tin roof, at $3.50 per square, $1.50 for laying, cost for your school house?

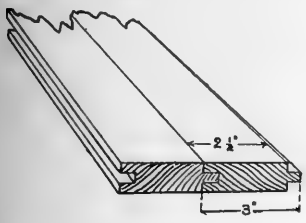
3. Which would be the less expensive roof for your

school house, the galvanized steel roof at $3.50 per square, paying 75c per square for laying, or a shingle roof at $3.25 per 1000, paying $1.00 for laying a square?

FLOORING

A board 2½ inches wide when tongued and grooved covers 2 inches of floor space; one 3 inches wide covers 2½ inches; one 4 inches wide covers 3¼ inches.

To estimate a bill of flooring or ceiling, measure the square feet of surface, to this add its one-fourth if 2½ inch flooring; one-fifth if 3 inch flooring; three-thirteenths if 4 inch flooring.



1. How many square feet of floor in your school room? How many square feet of flooring 3½ inches wide will it take? 4½ inches wide?

2. How many square feet of flooring 2½ inches wide will be required for a room 14 ft. by 16 ft.?

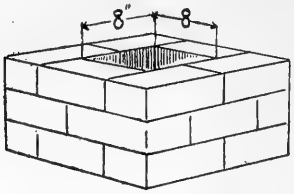
3. With oak flooring 2½ inches wide at $3.75 per hundred, what would it cost to floor your largest room at home? With pine flooring 2½ inches wide at $2.00 per hundred?

4. Estimate the number of feet of ceiling 4 inches wide it would take for your largest room at home? How many 3 inches wide?

5. When a carpenter is estimating the number of feet of flooring 2½ inches wide required for a room, why does he add to the number of square feet to be floored its one-fourth? Why its one-fifth, if 3 inch flooring?

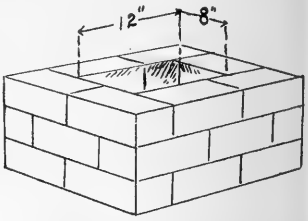
ESTIMATING THE NUMBER OF BRICKS FOR BUILDING FLUES

Bricks are usually 8 inches long, 4 inches wide, and 2 inches thick, and average in weight 5 pounds.



A flue for one stove is 8 inches in the clear. It takes 6 bricks for the round and 4 rounds to build a foot high.

A flue for two stoves is 12 inches by 8 inches in the clear. It takes 7 bricks for a round and 4 rounds to build a foot high.



1. How many bricks will it take for a 10 foot flue for one stove?

2. How many bricks will it take for a 14 foot flue for one stove?

3. How many bricks can be placed in a wagon bed 10 ft. long, 3 ft. wide, and 12 in. deep? What is the weight of the load?

4. How many bricks will it take for a 22 foot flue for two stoves?

5. With brick at $10 per 1000, what will the brick cost for a flue 12 in. by 8 in. in the clear, 27 ft. high?

6. How many trips must the wagon make to the brick yard to haul the brick in problem 5?

PAINTING

Allow 1 gallon of paint to every 250 square feet.

1. How many gallons of paint would it take for one coat for the walls and ceiling of the school room?

2. What would it cost to give the outside of the school house two coats of paint, with paint at $1.90 per gallon?

1,000 sq. ft. is considered a fair day's work for a painter.

3. Paying a painter $2.50 per day, with paint at $1.90 per gallon, what will be the cost of two coats of paint for the outside of your home?

4. Doing the work yourself, with paint at $1.60 per gallon, what will it cost to paint a floor 16 feet by 14 feet?

PAPERING

To estimate the rolls of paper required for the walls of a room, multiply the distance around the room in feet by the height in feet and divide by 72 if the rolls are double; by 36 if single. Deduct a double roll for each three openings.

A fractional roll is counted a whole roll, as broken rolls are never sold.

1. How many double rolls of paper would it take for the walls of your school room? For the ceiling?

2. At 15c per double roll for walls and ceiling, and 15c per roll for border, what would the paper for the school house cost?

3. At 20c per double roll for walls and ceiling, and 20c per double roll for border, what would the paper cost for your living room at home?

4. How much will it cost to paper your dining room with paper at 18c per double roll, border at the same price, paying 20c per double roll for hanging?

5. Bring to school the dimensions and number of

openings in two of your rooms at home, and estimate the cost of papering each, with paper and border at 20c per double roll, paying 20c per double roll for the hanging.

CUTTING RAFTERS

One-half the width of a house (the distance between the outside measurements of the wall plates) is called the run.

The height of the rafters at their highest point above the wall plates is called the rise.

A roof is one-half pitch when it is one foot high for every two feet in the width of the house.

A roof is one-fourth pitch when it is one foot high for every four feet in the width of the house.

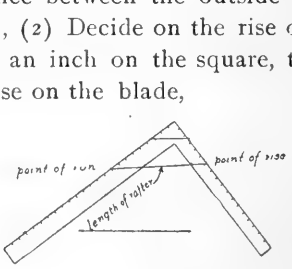
A roof is one-third pitch when it is one foot high for every three feet in width of the house.

A roof is two-third pitch when it is two feet high for every three feet in the width of the house.

The parts of a square are the blade and the tongue. The blade is the broad and long part. The tongue is the narrow and short part.

DETERMINING THE LENGTH OF A RAFTER

To get the length of rafters, (1) Measure the width of the house (distance between the outside measurements of the rafter plates), (2) Decide on the rise of the rafters, (3) Counting a foot an inch on the square, take one-half the width of the house on the blade,



(4) Take the rise on the tongue, (5) Place the square with these two points on a straight line or the straight edge of a board and mark the points; then measure the distance between the points for the length of the rafters.

Illustration:—A house 18 ft. wide is to have a roof one-third pitch, that is, the roof is to be one foot in height for every three feet in the width of the house. An inch on the square representing a foot, take on the blade of the square one-half the width of the house (9 in.), on the tongue take one-third the width of the house.

Measure on a straight line the distance between 9 on the blade and 6 on the tongue, for the length of the rafter without a projection over the side of the house.

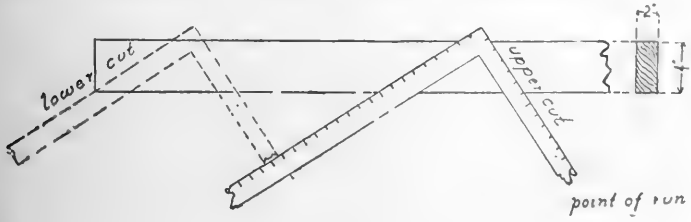
1. What length must rafters, without a projection, be cut for a shed 12 ft. wide, the roof to be one-third pitch?

2. What length must rafters, without a projection, be cut for a shed 12 ft. wide, the roof to be one-half pitch?

3. What length must rafters, without a projection, be cut for a roof 9 ft. wide, the roof to be two-third pitch?

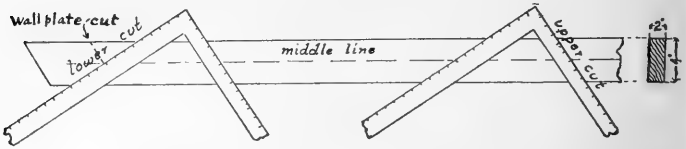
To cut a rafter pattern, without a projection, out of a 2 by 4 scantling.

(1) Lay off the length of the rafter on one of the straight edges of the 2 by 4, (2) Place the tongue of the square with the point of rise on the upper mark with the point of the run (on the blade) upon the same edge of the



scantling, (3) Mark the position of the tongue of the square for the upper cut, (4) Next place the point of the run (on the blade) on the lower point with the point of the rise (on the tongue) upon the same edge of the scantling, (5) Mark the position of the blade for the lower cut.

Cutting a rafter pattern with a projection for eaves, from a 2 by 4 scantling.



1. Draw a straight line along the middle of the broad side of a 2 by 4.

2. On this line lay off the length of the rafter without the projection.

3. Place the tongue of the square with the point of rise on the upper mark, with the point of the run (on the blade) upon the line.

4. Mark the position of the tongue of the square for the upper cut.

5. Next place the point of the run (on the blade) on the lower point with the point of the rise (on the tongue) upon the line.

6. Mark the position of the blade for the lower cut.

7. Before removing from this position erect to the square a perpendicular at the point of the run (on the blade) for the cut that fits against the outside of the roof plate.

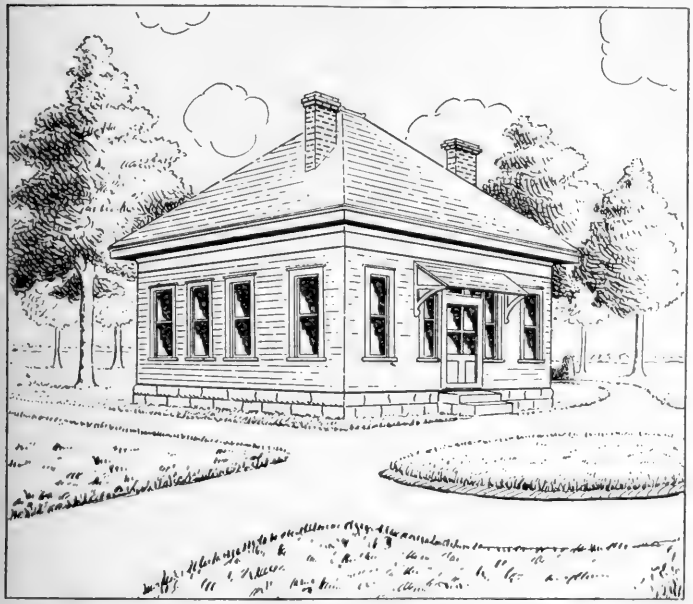
8. If the projection is to be a foot, saw off the rafter one foot below this mark.

1. Bring to school a straight board 4 in. wide and 12 feet long or longer.

2. Lay off on the board the pattern of a rafter for a house 18 ft. wide, one-third pitch, projection of each rafter one foot.

3. Lay off on the board the pattern of a rafter for a coal shed 8 ft. wide one-fourth pitch, projection of each rafter 9 in.

4. Lay off on the board the pattern of a rafter for a wagon shed 10 ft. wide, one-half pitch, projection 9 inches.

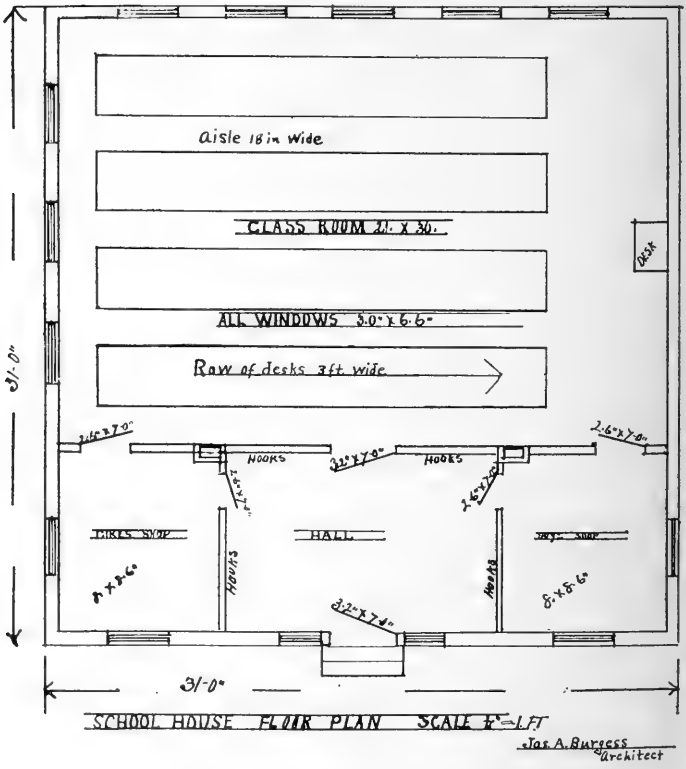


A MODEL ONE ROOM COUNTRY SCHOOL HOUSE

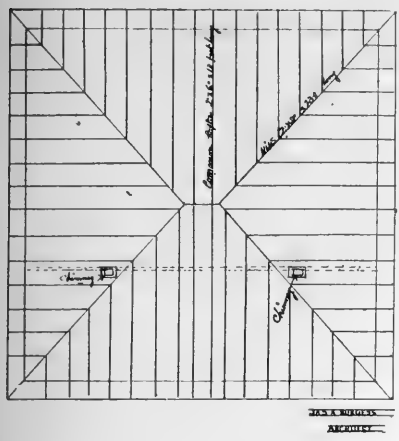
Estimate the lumber bill for this house.

Studding, 167 pieces, 2 in. by 4 in., 12 ft. long.
Sills, 16 pieces, 2 in. by 8 in., 16 ft. long.
Girders, 12 pieces, 2 in. by 8 in., 16 ft. long.
Floor joists, 40 pieces, 2 in. by 8 in., 10 ft. long.

Floor joists, 20 pieces, 2 in. by 8 in., 12 ft. long.
Ceiling joists, 40 pieces, 2 in. by 6 in., 16 ft. long.
Boxing (placed under weather-boarding).
Weather-boarding (6 in. width).
Ceiling ($3\frac{1}{2}$ in. width).
Floors ($3\frac{1}{2}$ in. width).
Brick for two one-stove flues, 14 ft. long.



THIS SHOWS MAIN SCHOOL ROOM WITH THE BOYS' AND GIRLS' WORK SHOPS.



Hip rafters, 4 pieces, 2 in. by 8 in., 24. ft. long.

Common rafters, 4 pieces, 2 in. by 6 in., 18 ft. long.

Jack rafters, 2 in. by 6 in., 450 ft. total length.

Sheeting, 450 feet.

Bunches of shingles (1100 sq. ft. in roof).

USING THE BANK

The first step to be taken in opening an account with a bank is to deposit some money, and receive a pass book in which all deposits are entered as credits. This book belongs to the customer and should be left with the bank monthly to be balanced, then it is returned to the owner with all canceled checks.

It is the customer's duty to examine carefully the account of all checks and report to the bank at once for the correction of any possible mistake.

Checks

A check is an order for a bank to pay a certain sum of money to the person designated, or his order, out of the deposit of the person who signs the check.

A check should be endorsed on the back before it is cashed. An endorsement is simply the signature of the owner of the check on the back of it.

HYDEN CITIZEN BANK

$ 10.00 HYDEN, KY., June 3, 1912

PAY TO THE ORDER OF Chester Dixon

— Ten — DOLLARS

FOR

No. 1 Felix Feltner

Where is the money deposited with which this check is to be paid?

Who gets the money on this check?

Who pays the check?

Whose name should appear on the back of the check when it is cashed?

Certified Checks

When away from home among strangers or when sending a check to strangers it is wise to use a certified check to make certain of having your check promptly honored or paid.

A certified check is one the payment of which is guaranteed by the cashier of the bank on which it is drawn.

HYDEN CITIZENS' BANK

HYDEN, KY., May 4, 1912.

Pay to the order of John W. Dinsmore $25.00

Twenty-Five — Dollars

For

No 17 John H. Asher.

Certified $25.00 Dollars W.S. Eversole, Cashier

CERTIFIED CHECK

Notes

A note is a written promise to pay a certain sum of money at a specified time.

The usual form of a note is:—

Booneville, Ky., March 1, 1912.

One year after date I promise to pay to the order of Raymond Davidson Eighty-five Dollars, for value received, with interest at 6 %.

Silas Moore.

1. Require each member of the class to give his note to a classmate. Continue this drill until note writing becomes a simple matter.

Interest

Interest is money paid for the use of money.

Interest is reckoned by the year.

To find the interest on the face of a note, multiply the face of the note by the rate of interest expressed as hundredths, and multiply by the number of years or that part of a year, which the time the note runs, is of a year.

Illustration:—

What is the interest on $200 at 6% for 1 yr. 6 mo.?

$200 (Principal)
.06 (Rate)
$12.00
1½ (Years). 1 yr. and 6 mo. = 1½ years.
$18.00 (Interest)

1. Find the interest on $500 for 3 years at 6%.
2. Find the interest on $50 for 1 yr. and 6 mo. at 6%.
3. Find the interest on $75 for 6 months at 6%.
4. Find the interest on $125 for 9 months at 6%.
5. Find the interest on $160 for 6 months at 8%.
6. Find the interest on $250 for 1 yr. and 3 months at 7%.

STATE AND LOCAL TAXES

The state must provide for taking care of the insane, the blind, the deaf and dumb, other unfortunates, and the criminals; it aids in supporting schools to educate the children; it must pay the salaries of the governor and other state officials, and look after general improvements, all of which is worth many more thousands of dollars to the people than it costs. The large sum of money required to do all this is obtained by taxing the property of the people.

The county has need of much money with which to educate its people, build bridges, roads, court houses, school houses, take care of its poor, and maintain courts of justice. These expenses are all met by taxing the people and their property.

A pole tax is a tax paid by each male citizen over 21 years of age without regard to how little or how much property he owns.

Real estate is any fixed property; as land and buildings.

Personal property is any movable property; as money, household goods, farming implements, cattle, etc.

Property tax is usually listed at so much per $100 valuation of property.

1. How much tax does a farmer pay who owns 80 acres of land valued at $30 an acre, assessed at 2-3 of its value, and personal property assessed at $600, if the rate of taxation is $1.50 per hundred?

2. How much tax does a farmer pay who owns 360 acres of land assessed at $3600, and personal property assessed at $900, if the rate of taxation is $1.50 per hundred?

3. How much does the administration of justice cost a county which pays annually on an average for 1944 days of jury service at $2.00 per day and for 2½ months of a Circuit Judge's time at the rate of $4200 a year?

4. It is estimated by the Circuit Judge presiding in

this county that 9-10 of the expense was incurred in prosecuting crime of which whiskey and ignorance were the direct cause. If this expense were to be met by a pole tax on the 1343 farmers in the county how much would be the share of each?

5. How many $800 school houses or churches could be built each year out of this waste?

The advanced pupils assisted by the teacher, might, with interest, make a list of the taxable property in their district, as the number of acres of land and its value; head of cattle, horses, sheep, etc., with the value of each. Such a list is called an assessment roll.

6. From this roll estimate the rate of local tax on the $100 valuation, to make $50 worth of repairs on the school house and buy a $25 library.

JUN 26 1912

SOME BOOKS A TEACHER SHOULD KNOW

Mother Goose, Book Supply Co., Chicago ..... $ .89
Jungle Book, *Kipling*, Book Supply Co., Chicago 1.20
Alice in Wonderland, *Lewis Carrol*, Book Supply Co., Chicago ..... .60
Pilgrim's Progress, *Bunyon*, Book Supply Co., Chicago ..... .60
Robinson Crusoe, *De Foe*, Book Supply Co., Chicago ..... .60
Little Women, *Alcott*, Book Supply Co., Chicago 1.05
Tales From Shakespeare, *Lamb*, Book Supply Co., Chicago ..... .60
Tom Brown's School Days, *Hughes*, Book Supply Co., Chicago ..... .34
Man Without a Country, *Hale*, Book Supply Co., Chicago ..... .34
Golden Numbers, *Wiggins and Smith*, McClurg, Chicago 2.00
Manners and Morals, *Shearer*, Richardson, New York City 1.00
Real Things in Nature, *Holden*, Macmillan Co., New York City ..... .65
He Can Who Thinks He Can, *Marden*, Crowell, New York City 1.10

TWO GOOD BOOKS FOR FARMERS

Agriculture for Beginners, *Burkett, Stevens, and Hill* Ginn & Co., Chicago ..... $.85
The Principles of Agriculture, *Bailey*, Macmillan Co., New York City $1.40

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